

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY
FOREST INSECT INVESTIGATIONS

THE FLIGHTS OR DISSEMINATION OF FOREST INSECTS

1933

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THE FLIGHTS OR DISSIMINATION OF FOREST INSECTS

The results secured by certain artificial control projects against enidemics of the mountain pine beetle (Dendroctonus monticolee Ropk.) in the lodgepole pine stands of Montana and in the white pine stands of Idaho seem to indicate that flights of these bank beetles occur. Heavy reinfestations or sharp decreases have occurred where they were least expected, causing increases of several bundred percent on areas where all the infested timber had been treated; while adjoining areas where no control had been instituted showed a decrease. Such a condition could be caused by several factors, but in many instances the flight of insects from one area into another would seem to be the only logical explanation.

In Montana has been studied as it occurred in successive stages from the Flatherd National Forest south through the Missoula, Titterroot, Beaverhead, and Madison Forests. In many instances there were rether wide areas of open country between these forests and sometimes within the forests. Again, the only logical explanation of this occurrence seems to be the flight of the insects from one area to another.

have on all phases of control, a series of flight studies were started in 1931 by placing traps on several high mountain peaks in northern Idaho and enstern Tashington. May were placed on high timberless peaks so that the insects would be caught while flying at those high elevations. The traps were of the automatic, weather-vane type and usually placed on poles about eighteen feet above the highest point of the peak. They were always faced into the wind by the action of a weather-vane fail; therefore, collections

were made only of insects being born with the wind. The insects collected were automatically preserved in a cyanide jar at the bottom of the trop.

The following peaks were selected for the experiment:

Round top	5800 ft.	Kaniksu Nation	al Forest	
Sulliven	6200 ft	n n	2 n	
Little Guard	6000 ft.	Coeur d'Alene	National	Forast
Grizzly	6000 ft.	u	n	N
Aresey	5200 ft.	н	H	H
Inerald	4657 ft.	St. Joe Wating	el Forest	

During 1931 and 1932, three important orders were collected:
Coleopters, Dipters, and Mymenopters. Twenty of the 65 species of Coleopters collected were bank beetless. The mountain pine beetle was taken from the traps on both Soundtop and Sullivan mountains. Although these traps were not far from the timber, insects passing this point could, no doubt, have been blown for many miles before descending to the ground.

The following list presents the more important insects collected and the relative number to show abundance. The number of insects collected in the family Formicidae is not accurate however, as species of this family were sometimes so numerous as to almost fill the collecting jer.

LIST NO. 1

Insect		Number Taken	Cete	Locality
COLIDPTERA				
Carabidae Sericada	bembidioides Kby.	1	8/30/32	Little Guard "t. Coeur d'Alena, Ida.
				Roundtop Mt.
<u>Bericode</u>	guedropunctata Dej.	1	8/1/32	Metaline Malls, Mash.
				Sulliven Mt.
Herpalus	80.	1	7/15/32	Meteline Fells, Jach.
Merpalue	8p.	1	7/8/31	Greeny d'Alene, Ide.

Insect	Number Teken	<u>Da te</u>	Local1ty
COLFOPTERA Hydrophilidae Spheeridium mcarebaeoides L.	1	7/23/31	Roundtop Mt. Neteline Falls, Wash.
Silphidae Hydnobius longulus Lec.	1	7/9/32	Roundtop Mt. Wetaline Felle, Wash.
Stephylinidae Pelecomelium puberulum Fvl.	5	7/13/32	Grassy Mt. Coeur d'Alone, Ide.
Gyrohypmis obsidianus Mels	1	7/31/32	Little Guard It. Coeur d'Alene, Ida.
Quedius marginalis Makl.	1	7/15/32	Sullivan Mt. Metaline Falls, Mash.
Quedius marginalis Makl.	1	8/12/31	Moundtop Wt. Metaline Valla, Eash.
Tachinus augustetus Horn.	1	7/8/31	Greasy Mt. Coeur d'Alene, Idn.
Bryoporus rufescons Lec.	1	7/31/31	Gressy Mt. Coeur d'Alene, Ide.
Aleocheringe genus ?	1	7/9/32	Roundtop Ut. Metaline Pells, Math.
Atheta sp.	1	7/8/31	Greasy Mt. Cocur d'Alene, Ida.
Baryodma bimaculata Grav.	1	8/12/31	Neundtop Mt. Wetaline Falls, Jesh.
Pselaphidee Oropus ap. ?	1	7/8/31	Roundtoo Vt.
Walyridse Dasytes hudsonicus Lec.	1.	7/24/32	Grizzly Mt. Cogur d'Alene, Idn.
Desytes hudsonicus Lec.	9	7/21/32	Little Buard Vt. Coeur d'Alone, Ida.
Cleriden Moclerus teconței Vole.	1	7/30/31	Roundtop Wt. Wetaline Walls, wah.

Market, Market Barrier, Market Barrier, San Carlotte, State of the Control of the	Number		
Insect	taken	Data	Locality
COLIDPTERA			
Mordellidae			Grussy Wt.
Anespisatrata Champ.	1	7/30/31	Coeur d'Alene, Ida.
			Grossy Wt.
Anasoisatrate Chamo.	1	7/8/31	Coeur d'Alene, Ida.
MICONATCUA DE CHEMIO.		(1,01)7	boent a wiene, 10se
Materidae		7/12/20	Grassy Mt.
Limonius neger i.ec.	1	7/13/32	Coeur d'Alone, Ide.
			Grassy 't.
Betarmon bigeminatus Randell	15-11 man	7/8/31	Coent d'Alene, Ida.
Buprestidae			Grinaly Wt.
Ruprestis lengi unn.	1	8/17/32	Coeur d'Alene, Idn.
THE RESERVE OF THE PARTY OF THE			
			Emerali Mt.
Melanophila fulvoguttata Var	. 1	8/3/32	rinceton, Ida.
A SAME AND SAME AND			Thereld Mt.
i elanophila drummondi Kby.	1	8/17/32	Princeton, Ida.
Ostomidse			Grassy Mt.
Tempochila vivescens Teb.		8/23/32	Coeur d'Alene, Ida.
SEMINGRETT A FACTORIES		عر الريارة	oogas a sacare 1/120
	To the		Yahaha Amama Ma
Nitidolinae		0/20/70	Little Querd Nt.
Nitidula bipungtate L.		8/20/32	Coeur d'Alene, Ida.
Cryptophagidae			Grassy Mt.
Cryo tophague so		7/31/31	Coeur d'Alene, Idn.
			Grizzly Vt.
Cryptophague sp.	1	8/23/32	Coeur d'Alene, Ide.
		1	
Colydildae			Round top 't.
Lascono tus schuprei Kraus.		8/10/32	Metaline Falls, Wesh.
			74447 0 0000
Lathrididae	3	8/70/70	Little Guard Vt.
Corticaria occidua Fall.	31. 31. 24.	8/30/32	Coeur d'Alens, Ida.
Coccinellidae	372 4		Grassy lit.
Psyllobura separata Cay.	1393	7/13/32	Coeur d'Al ne, Ida.

建筑的	Number		
Insact	Taken	Date	Locality
Colforthan Coccinellidae Hyppodamia caseyi Johne.	3	¥/2/31	Roundte; Wt.
Cleis minor Cay.	7	8/20/32	Little Guard Mt. Coeur d'Alene, Ida.
Anatis guindecimpunctate Ol.	3	8/10/32	Little Guard Mt. Cocur d'Alene, Ida.
Neomysia oregona Cay.	1	7/31/32	Little Guard Mt. Coeur d'Alene, Ida.
Tenebrionidae Hypophloeus ap.	1	7/19/31	Roundtop Wt. Metaline Falls, Tash.
Hypophlogus ap.	1	8/30/31	Roundtop Mt. Botaline Falls, Fogh.
Hypophloeus ep.	1	7/20/32	Roundtop Wt. Metaline Valls, Mash.
Anoblidae gentills Fall.	1	7/18/32	Noundtop Yt.
Cerembycidae Stenocorus inouisitor Linn.	1	7/8/31	Round top Mt.
Anoplerde canadensis Pab.	1	8/17/32	Grissly Mt. Coeur d'Alene, Ida.
Monochamus oreconensis	1	8/23/32	Coeur d'Alene, Idr.
Chrysomelidae Pachybrechia	2	7/31/32	Little Guard Pt. Coeur d'Alene, Ida.
Diachos eresus Lec.	1	8/3/32	Grassy Mt. Coeur d'Alens, Ida.
Luperodes verices Lec.	1	7/8/31	Roundtop #t. Metaline Balls, Tdp.
Innerodes veripes Lec.	6	8/30/33	Little Guard Mt. Coeur d'Alone, Ida.
Luperodes veripes Lec.	1	7/8/31	Grassy "t. Coeur d'Alene, Idr.

	Number		
Insect	Taken	Date	Locality
COLTOPITE		Lego.	
Curculianidae			Round too Wt.
Chinometer comptus Tec.	1	8/1/32	Petaline Falls, Wash.
			Roundtop l't.
Sitona ep.	2	7/11/31	Metaline Falls, Mah.
			Grizzly Mt.
Fuclyptus rutilus Pall.	1	8/29/32	Cogur d'Alene, Ida.
		STATE OF THE STATE OF	Round top Vt.
Tychlus tectus Lec.	1	7/20/32	Metaline Falle, Wash.
			Out uplay 11A
Mardalis sp. 7	1	8/7/32	Grizzly Mt. Coeur d'Alene, Ida.
		7 17 2	
Scolytidae			Roundtop Ht.
Scolytus unisoinosus Lec.		7/23/31	Motaline Palls, Mach.
		A 40 4 510	
Scolytus praeceps Lec.	1	7/18/32	Princeton, Ida.
ACOLY MAY GIRSCERA VEC.		1120150	FIGURE SON, Ide:
		0102120	Gresy "t.
Scolytus praecent Lec.		8/23/32	Coeur d'Alene, Ida.
		1	Orasey &t.
Scolytus ventralis Lec.	3	8/23/32	Comr d'Alene, Ida.
		1 A S A S A S A S A S A S A S A S A S A	Round top 11.
Scolytus ventrelis Lec.	3	7/17/31	Notaline Falls, Eash.
			Grassy Ft.
Scolytus ventralis f.ec.	3	8/23/32	Coeur d'Alene, Ida.
	19 No. 19		Emerald Mt.
Scolytue abietis n. sp.	1	7/18/32	Princeton, Ida.
			Gressy Mt.
Scolytus laricis n. sp.	2	7/8/31	Coeur d'Alone, Ida.
			设施的总统经验,对各种实
Deline and a the		8/16/31	Roundtop Nt.
Polygrochus rufipennis Kby.		8/10/31	Weteline Talls, Tash.
			Round top 4t.
Polygraphus rufipennia Kby.		5/20/31	Voteline Falls, Jach.
			Roundtop #t.
Polygraphus rufipennis Rby.	5	7/8/31	Metrline Pells, Wash.
			Grassy Mt.
Polygraphus rufipennis Kby.	1	8/15/31	Coeur d'Alene, Ida.
			STREET, STREET

	Number		
Insect	Token	Deta	Locality
COLEOPHERA			
Scolytidae			Round top Mt.
Capahoboru's ap.	2 2	7/15/32	Metaline Falls, Wash.
			Roundtop Mt.
Dendroctonus monticulae Hopi	c. 1	7/29/31	Metaline Talls, Tash.
			Sullivan Lt.
Dendroctomus monticolas Hopk	c. 1	7/15/32	Wet line Falla, Wash.
			Grizzly Mt.
Dendroctenus valens Lec.		7/24/32	Coeur d'Aleng, Ida.
			Round top A.t.
Pseudehy lesinus nebulosus I	lec.l	8/20/31	Wetaline Falls, Wash.
		ALC: NO	Sullivan Mt.
Pl tyoph thome tuberculatus	ich.3	7/30/32	Metaline Falls. Kman.
			Roundton It.
Pityoohthorus tuberculatus 1	lich.Z	7/8/31	Metaline Polls, Weeh.
			Roundtop Mt.
Pityophthorus pseudotsugae	W. 2	7/15/32	Metaline Falls, Wesh.
			Sullivan Mt.
Pityophthorus murrayanse Bla	cm. 3	7/23/32	Metoline Falls, Mach.
			Roundtop # t.
Pityophthorus sp.		8/19/31	Metaline Palls, Pagi.
			Found top t.
Pityogenes fossifrons lec.	7	7/15/31	Metaline Palls, Manh
			Round top Vt.
Pityogenes fossifrons Lec.	1	8/20/31	Peteline Falls, Wash
			Roundtop Mt.
Pityogenes fossifrons Lec.	7	7/8/31	Yetrline Falls, Wash
		242 1720	Roundtop Kt.
Pityogenes fossifrons Lec. ?	14	7/15/32	Mateline Falls, Mash
		minutes.	Round top "t.
Fityogenes fossifrons Lec.		7/23/32	Metaline Falls, meh.
	7.224	012-122	Round top Wt.
Pityogenes fossifrons Lec.	100	8/19/31	Metaline Falls, Wash.

	Number		
Insect	Taken	Date	Locality
COLHOPTERA Scolytidae Pityogenes knechteli SW.	1	7/29/33	Kite Trab Dillon, Montana
Ips vancouveri Sw.	2	7/29/31	Roundtop Wt. Wetaline Falls, Wesh.
Ips orecon! Wich.	1	8/20/31	Houndtop Mt. Metaline Walls, Wash.
Ips oregoni Eich.	1	7/28/33	Kite Trap Dillon, Montana
Pityokteines elegans 5%.	1	7/24/32	Grizzly Mt. Goeur l'Alene, Ida.
Pityokteines minutus St.	2	7/8/31	Roundtop Mt. Wesh.
Pityokteines minutus SV.	3	7/11/31	Roundtop Mt. Metaline Palls, Mash.
Pityokteines minutus SW.	1	8/19/31	Roundtop Mt. Metaline Palls, Wash.
Pityokteines minutus SW.	g	7/15/32	Roundton Mt. Metaline Falls, Wesh.
DIPTERA			
Simulidae Prosimulium sp.	1	7/7/32	Grizzly "t. Cosur d'Alene, Ide.
Asilidne Asilus mesee Tuckor	1	7/8/31	Grassy Mt. Corur d'Alene, Ida.
Empididae Oedales so.	i	8/12/31	Roundtop Nt.
Hilara sp.	1	7/17/32	Grizzly Ut. Coeur d'Aleno, Ide.
Rhamphowyia 43.	1	7/13/32	Sullivan Mt. Metaline Fells, Wash.
Phoridae	1	7/8/31	Grassy "t. Coeur d'Alens, Ida.
	STREET, STREET		

Insect	Number Taken	Date	<u>locality</u>
DIFTERA			
Pipunculidae			Grassy Mt.
Pipunculus sp.	1	8/23/32	Coeur d'Alene, Ida.
Tachinidae			Little Guard Mt.
Techinid genera	1	8/10/32	Coeur i'Alene, Ida.
An thomyi idee			Sullivan Mt.
An thomy 11d	1	8/20/32	Metaline Palls, Wash.
Hylemyin	6	7/13/32	Greesy Mt. Cosur d'Alene, Ida.
Pylemyia	1	8/20/32	Little Guard Mt.
		1.50135	Coeur d'Alene, Ida.
Schoenomyza doreslie La.			Grassy Mt.
School State Constitution	1	7/13/32	Compr d'Alana, Ida.
Helumyzidze			Orizely Mt.
	1	5/7/32	Coor d'Alene, Ida.
Borboridae			Hound top Mt.
	1	7/8/31	Mataline Falls, Wash.
			Grassy Mt.
Porborus equinus Pall.	1	7/13/32	Comer d'Alene, Ide.
Sapronayzidae			Grizzly Mt.
1	1	7/17/32	Comr d'Alene, Ida.
Sepsidae			Grizely Mt.
Piophila nigricens Mg.	1	7/17/32	Coeur d'Alene, Ida.
Geomyzidae			Gressy ut.
8D •	1	7/8/31	Coeur d'alene, Idc.
	Market St.		
Ochthinhilidae			Grizzly Mt.
Leuconis sp.	3	7/2 /32	Coeur d'Alene, Ide.

Insect	Number Taken	<u>[nte</u>	Locality
HYMUNOPUSRA			
Braconidee Micreolitis plulettee lus.	1	7/17/32	Grizzly Mt. Coeur d'Alène, Ids.
Anhidius procephali Ashm.	1	7/12/32	Roundtop Mt. Metaline Palls, Wash.
Aphidius juniperaphidia Gaha	n 1.	7/21/32	Little Guard Mt. Coeur d'Alene, Ida.
Ephedrus nigricornis Gahen	1	8/29/32	Grizzly Mt. Coeur d'Alone, Ida.
FORTE Sp.	1	8/7/32	Orissly Mt. Coeur d'Alens, Ida.
Chelonu ap.	1	8/7/32	Grizzly Mt. Cosur d'Alane, Ida.
Apantel es to.	1	7/31/31	Grassy Mt. Coeur d'Alene, Ida.
Trisspin sp.	1	7/21/32	Little Corrd Vt. Coeur d'Alene, Ids.
Ichneumonidae Stylocryptus n. *p.	1	8/2/31	Roundtop Mt. Metalira Falls, Wash.
Stolocryptus vulgaris Cress.	1	8/23/32	Grassy Mt. Coeur d'Alene, Ide.
Hemitelini ap.	1	8/20/32	Little Guard Mt. Coeur d'Alene, Ide.
Pohialtes sanguineipes Cress.	. 1	8/20/32	Little Guard Nt. Coeur d'Alens, Ida.
Gelia sp.	1	7/8/31	Gressy Wt. Coeur d'Alene, Ide.
Phaeogenes n. sp.	1	7/8/31	Grassy Mt. Coeur d'Alene, Ida.
Pteromelidae Pachyneuron allograpiae	1	6/23/32	Greeny ut. Coeur d'Alene, Ide.
Pseudoca tolaccus quericamus (ah. 1	8/23/32	Grassy Nt. Coeur d'Alene, Ide.

Insect	Taken	Date	Locality
HYMENOPYERA			
Pteromalidae			Orisely Mt.
Habrecytus ap.	1	8/29/32	Coeur d'Alene, Ida.
Burytomidee			Greasy Mt.
Eurytons ap.	9.	8/23/32	Coeur d'Alene, Ida.
Sucharidae			Grizzly Mt.
Pseudochalcura ? gibbosa Say.	1	8/7/32	Coeur d'Alene, Ida.
Scelionidae			Grizzly Mt.
Telenomus sp.	1	7/24/32	Coeur d'Alana, Ida.
			A A COMPANY OF THE PARTY OF THE
Formicidae.			Round top 11.
Formics fusca L. var.	4.	7/30/31	Metaline Falls, Mash.
			Grizely Wt.
Prenolepis imparis Say. 5	1	8/7/32	Coeur d'Alene, ide.
			Little Guard Mt.
Formics ap.	2	8/10/32	Coeur d'Alens, Ida.
· · · · · · · · · · · · · · · · · · ·	05	2/22/20	Grassy 1 to
tyrmics an.	25	7/31/31	Coeur d'len, d.
		710179	Grassy Wt.
llyraice 20.	15	7/8/31	Coeur d'Alone, Ida.
***************************************	306	7/70/71	Round top Mt.
Myraice sp.	300	7/30/31	Metaline Falls, Wash.
Myrmics sp.	21.8	8/19/31	Roundtop Mt. Metaline Falls, Wash.
EN ANA CAS		0/19/91	
Marcant na an	g	8/25/32	Sullivan Mt.
Myrmica so.		0/63/36	Metaline Falls, mash.
Chrysididae			Grassy Mt.
Fllamous sp.	1	7/24/32	Coeur d'Alene, Ide.
Sphecidee			Grissly Wt.
Passaloecus so.	1	8/7/32	Coeur d'Alene, Tdn.

A mistake in the use of weather-vene traps was that they were not

located far enough from infested timber, for while the insects caught were taken in flight over some of our highest peaks, it did not prove that they went higher nor did it prove that they flow for long distances. In the future, weather-wane traps will be placed on open ridges or plains with less regard to altitude, and more thought to distance from timber.

Further work was undertaken by the use of Glick aeroplane traps which were fastened to the wings of an observation plane. Collections were made on a series of gummed screens which were exposed at various altitudes. However, insects collected in this manner were usually so badly damaged as to prevent determination.

Collections from the aeroplene traps made over Yellowstone Park and over the Coeur d'Alène Forest are given in the following list. The altitudes given are eltimeter readings taken at the time of exposure and vary from 500 feet to several thousand feet above the ground. The rough topography over which the collections were made prohibited any accurate data as to the height at which the insects were taken. Exposures were made as high as 13.000 feet, but without results. Nearly all the insects were taken at lower elevations.

LIST NO. 2 GLICK APROPLANT TRAPS

Insect	Locality	Altitude	Date
DIPTERA Scioridae *p.	Tellowstone Park. Tyo. Yellowstone Fark. Tyo.	6600 6000	7/9/31 7/9/31
Chironomidae	Tello stone Park, yo.	6000	7/9/31
Empldidae	Yellowstone Park, Tyo.	9200	7/9/31
Dolichopodidae	Yellowstone Park, Myo.	9600	7/9/31

Insect	Locality	Altitude	Date
DIPTERA			
Dolichopodidae		E200	=/0/73
70.	Yellowstone Park, Wyo.	\$200	7/9/31
Phoridae			
Megaselia ap.	Yellowstone Perk, Tyo.	9200	7/9/31
Syrphidae			
Syrohus so.	Yellowstone Park, wyo.	THE RESIDENCE OF THE PARTY OF T	7/9/31
Syrphus an.	Coour d'Alene Forast, Ida	- 3000-6000	7/31/32
	(2 specimen)		
An thomy iidae			
Rylemyia cilicura Foli.	Yellowstone Park, yo.		7/9/31
Hylemyia so.	Comur d'Alene Forest, Ida (3 specimen)	- 3000-5000	7/21/32
HYMPHOPTERA			
I chneumonidae	Yallaustana Benk Wya	9600	7/0/73
Plecticus ap.	Yellowstone Park, Wyo.	9000	7/9/31
Pteromal idae			
Pteromelidae ap.	Telloastone Park, Nyo.	9000	7/9/31
Pachyneuron ep.	Yellowstone Park, Wyo.	6600	7/9/31
Pachyneuron ap.	Yellowstone Park, yo.	9600	7/9/31
THE THEOLOGY SO.	terrows come care, Tyo.		1/9/01
Encyrtidae		(600	
Berecyntus bakeri ver.		6000-	7/0/7
gemma Gir.	Yellowatone Park, Wo.	6600-8800	7/9/31
Vicroter's in.	Yellowstone Park, Wyo.	7500	7/9/31
Eurytomidae	Coeur d'Alene Forest, Ida.	3000-5000	7/31/32
THE STATE OF	foods west and so seed for	7000-7000	11 11/7

During the past summer, large nets shaped much like an eirport windsock with the end termineting in a small screen bottle were relied by means of large Weather Bureau kites. It was found that in a fair wind one of these kites would raise a net with twelve square feet of catching surface to altitudes as high an 8,000 feet above the ground. Steel pinno wire was used for a kite string and a hand real weighing about seventy pounds was

used to raise and lower the kites. The field work was conducted seven miles southwest of Dillon, Montana, in the open plains between the Reaverhead and the Madison Porests. The location chosen was some twenty-five miles from timber in the direction from which the prevailing wind came; fourteen miles from timber to the northwest; and ten miles from timber to the southeast. The wind varied from the southwest to west during the flights. Tight successful flights were made giving a total of 29 hours and 30 minutes in the air at elevations up to 8,000 feet above the ground.

collections made with these traps consisted mainly of small flies as yet undetermined. However, two scolytids were collected; one (Ios oregoni Rich.) was taken from the trap of ter a flight of 72 hours during which the lite veried from 1500 to 5000 feet above the ground; one (Pityogenes knechteli Sm.) was taken after a flight of 82 hours. Little value can be given to the capture of insects other than the scolytide because they my have been taken near the ground while the kite was being mised or lowered, but the collection of the two scolytide in flight so far from timber is significant that long flights of these species actually occur.

be made to open and close the trap while in flight. This and the veriation of the kite while in flight were the only objectional features encountered.

Respectfully submitted.

T.T. Terroll
Assistant Scientific Aid



The weather-vane trap in action on Gracky mountain.



Chick seropiane trupe agented between the wings of an observation plane.

The picture shows the collecting enteres expected.



Kites and twel used for high altitude collections.
One of the collecting note is shown in the foreground.